

Programming to develop reports during online classes generating docx or pdf files including mathematical analysis and graphic expression of remote activities

Programación para desarrollar reportes durante la modalidad de clases en línea generando archivos docx o pdf incluyendo el análisis matemático y la expresión gráfica de las actividades a distancia

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Abstract

The programming was designed to develop reports that include mathematical and graphical analysis during the online class modality. The report generator included within the MATLAB software libraries allows the generation of files in pdf, word, power point and html formats to be developed through programming. The software captures and generates dynamic reports of the results and graphical expressions to document the results in a single report, facilitating collaboration with other users to share a template based on professional standards in companies, organizations, educational institutions and universities. Importing libraries like mlreportgen.dom and mlreportgen.report into a script, specifies the structure of objects such as the header, titles and subtitles, image footer and table citation. The report for the delivery of online activities, students are required to enter their personal information, the report includes the equations and the results generated by the template makes it easy for students to deliver the activities instantly. Obtaining a script capable of generating reports with professional standards of remote activities, developed for delivery, thus allowing immediate collaboration and evaluation

Resumen

Se diseñó la programación para desarrollar reportes que incluyen el análisis matemático y gráfico durante la modalidad de clases en línea. El generador de reportes incluido dentro de las librerías del software de MATLAB permite desarrollar a través de la programación la generación de archivos en formatos pdf, word, power point y html. El software captura y genera reportes dinámicos de los resultados y las expresiones gráficas para documentar los resultados en un único informe, facilitando la colaboración con otros usuarios para compartir una plantilla basados en los estándares profesionales en empresas, organizaciones, instituciones educativas y universidades. La importación de librerías como mlreportgen.dom y mlreportgen.report dentro de un script, especifica la estructura de objetos como el encabezado, títulos y subtítulos, pie de imagen y la cita de tablas. El reporte para la entrega de actividades en línea se requiere que los estudiantes ingresen su información personal, el reporte incluye las ecuaciones y los resultados que genera la plantilla facilita que los estudiantes entreguen las actividades al instante. Obteniendo un script capaz de generar reportes con estándares profesionales de las actividades a distancia, desarrolladas para su entrega permitiendo con esto la colaboración y la evaluación de manera inmediata.

Dynamic reports, Online classes, Evaluation

Reportes dinámicos, Clases en línea, Evaluación

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Introduction

The implementation in the delivery of activities in online classes is very important since many platforms that offer learning management tools for virtual classes such as: BrainCert, OpenEduCat, Classtime, Edsby, Unik LMS, SkyPrep, Tovuti, Flumind, iTacit, Eduflow, Teleskill Live, Edtek LMS, Jforma, Absorb LMS, Thought Industries, Google Classroom and Moodle, among others, accept the sending of activities carried out online, tasks, reports, logs, etc., are requested in pdf formats, docx, ppt, html, but today more than ever the global situation of confinements due to severe acute respiratory syndrome (SARS CoV2), and the disease it causes is called COVID-19. It has made certain programs available free of charge for academics and students to make use of the tools that the National Autonomous University of Mexico has provided through agreements with The MathWorks company. This facilitates students of the electrical and electronic engineering career of the Faculty of Higher Studies Aragón. Many schools in different parts of the world, many educators and students were not prepared for online education. This transition has caused considerable problems. This challenging period forced a change in the way of learning, the use of learning aids, and taught new educational possibilities. By switching to other tools used in the educational process, teachers, as well as students, had to acquire new skills, for example, working with new software to generate reports for their distance evaluations in the Electronic Electrical Engineering Career (M. Trojanová, 2021).

One year and eight months after the start of the COVID-19 pandemic, almost half of the world's students are still affected by the partial or total closure of schools. UNESCO is tracking through a virtual map on its portal to support countries in their efforts to mitigate the impact of school closings, address the issue of learning losses and adapt their education systems, especially for communities. most vulnerable and disadvantaged. To mobilize and support the continuation of education, UNESCO established the Global Coalition for Education, which currently has more than 160 members working on three core issues: gender, connectivity and teachers (UNESCO, 2021).

Through these central themes, the operation of mechanisms and public and / or remote information is developed; take measures so that Universities can continue to operate with remote information and communication systems; as well as the use of a distance learning platform to continue facilitating the teaching-learning of students. In the event that no tool is available, it is possible to implement any of the multiple applications and educational platforms, bearing in mind that part of the students may only be able to use smart devices (Ojeda Misses, 2021). In order to understand distance education, several authors define it by mentioning the following: "Distance education is based on a didactic dialogue mediated between teachers of an institution and the students who, located in a different space than the former, can learn from independently or in a group". Which it indicates to be valid in different contexts, encompassing almost all the denominations and forms linked to this modality, which has been enriched thanks to increasingly sophisticated technology (Reyes Campos, 2021).

Allowing Professional and Comprehensive training, this implies acquiring mastery of operations and instruments, appropriation of knowledge and adaptability that promote the use of new technologies. Training, then, is not a static process and must transcend current needs, so the instructor must be a model of coherence. Likewise, the contemporary instructor must demonstrate a solid handling of Information and Communication Technologies - ICT". The new normal creates a need for instructors to continually update themselves in the use of digital tools. It is decontextualized, for example, teaching the apprentice theories that no longer have applicability or the use of obsolete techniques and tools. For this reason, training programs are subject to curricular redesign updates, training projects must be modified according to the new needs and problems of the productive sector, where relevant, the relevance and coherence of the instructor in front of the contents he imparts. Therefore, the training of the instructor must be permanent and contextualized with the new technical, pedagogical, didactic and methodological changes (González Alarcón, 2021). It is indisputable that teachers are doing a great job, it is not just trying to fulfill an academic program, but keeping in touch, making a presence despite the distance; with the information sent such as: notes, dynamic reports, presentations, videos, in addition to showing interest in students.

The introduction of ICT and TAC (for its acronym Learning and Knowledge Technologies) in school processes "opens a new range of possibilities, especially if one takes into account that in life in society it becomes daily and necessary, presenting a scenario where children grow up with the internet, using computers, smartphone, tablets, game consoles, virtual voice assistants and digital televisions". Then, it will be necessary to add to the teacher one more task to those already mentioned above, which consists of reviewing the programming established at the national level to distinguish those contents that the student will see at home to send related activities through booklets, guides and / or photocopies. Alternatively, there are those who have been working through smartphone applications such as WhatsApp, Facebook, Messenger and Telegram, among other applications that are widely used at an educational level in the current scenario as a means of linking and monitoring (del Rosario Zamora -Betancourt, 2021).

There are other programs that allow the development of reports for the information system, such as SYNTHESES. The preview function in this program allows users to download the generated report in the desired file format, such as pdf, docx or xlsx. It is used when the report was generated using a template. After downloading the file, the scenarios are completed, as the reports can be exported. (Paterakis, 2021). The reporting service enables clients to receive outbound reports in a single request-response.

The report service is a synchronous request, which means that the caller will be blocked until the report is generated and returned in the response. For large data sets or long reports, the delay can be significant. If you want to use non-blocking (asynchronous) request, the output type are: html, pdf, csv, docx, pptx, xls, xlsx, rtf, odt, ods, xml, metadata output: data_csv, data_xls, data_json (TIBCO, 2021). In 2008 the company Adobe Systems revolutionized the publication of digital documents with a standard format called PDF (portable document format for its acronym in English).

Although it is true that the positive impact of this type of files has been unquestionable, allowing the sharing of all kinds of information for reading, at present the functioning of PDF's is insufficient as we are in a society where users normally adopt the need to become prosumers of their meaning as a consumer of a product or a service that at the same time participates in its production. On the other hand, the Wolfram Research company, noticing these changes and the need for more flexible business requirements for decision making, developed a proprietary file type called CDF (acronym for: computable document format) which establishes a document format capable of run for free, in many cases, through different operating systems. The CDF's can be deployed for use by installing a free multiplatform plug-in (for Windows, MAC and Linux operating systems).

The technological architecture of a document with a computable format is based on the computational power provided by the Wolfram language. With very few exceptions, practically everything that can be developed in a conventional Mathematica notebook will be an easy resource to export as a CDF (Quesada, 2020). Another company that is revolutionizing and is positioning itself in innovation in the requirements of a need in all areas such as scientific, business and education, the MathWorks company with the MATLAB program is very well considered not only as a numerical computing environment commercial, but also as a programming language, contains a standard library, but its uses include matrix algebra and a large network for data processing and plotting. It also contains student toolkits, but this will cost the user more. Although both Python and R are open source programming languages, you don't have to be a programmer to use them. While programs like Excel and SPSS can be simpler and faster to learn, their computational skills are far inferior to Python, R, and MATLAB, which only require basic programming knowledge (Ozgur, 2021). However MATLAB, together with its family of toolbox or toolbox, it is widely used for the analysis and design of a large number of real-life engineering problems covering areas such as signal processing, control system design, etc.

The result of a problem solved with MATLAB can be included in a Microsoft Word document using the notebook supplied with MATLAB or the MATLAB / Simulink report generator toolbox, available or separately. In academic institutions, documentation is commonly done using LATEX. Although graphics generated by MATLAB can be saved in PostScript format and then included in a LATEX document, there is currently no way to directly include numeric data and text in a LATEX program. Manual inclusion of such data is error prone and time consuming. When data sets or graphics are to be included in a LATEX document, the programming power of MATLAB can be used effectively. There are applications that are being carried out using the MATLAB module of the control systems toolbox and its functionality is increasing (Talole, 2003). For a student who intends to enter a career in some of these areas such as: Physical Sciences, Technology, Engineering and Mathematics, the calculations are relevant, but at the same time they are difficult when the student has a visual disability. That is why research in Educational Mathematics indicates that this subject by itself is complicated for most students. They point out two aspects that are central to the problem of learning the first, that in calculus, objects must be represented graphically, especially graphs. of functions and a second aspect is that you must have an analytical representation of these objects, one of the programs that allow us to generate presentations is LaTeX, that is, it creates documents or reports in PDF format, and respects the syntax of the different areas. Free software has become one of the fastest growing technological movements of the 21st century. Python was created by Guido van Rossum, a Dutch programmer in the late 1980s and early 1990s when he was working on the Amoeba operating system. Firstly. For its development it has been necessary to have a group of tools that make their use optimal and are easy to learn. Python is a programming language that complies with what has been proposed and has been emerging as a recommended option for the development of free software, it is currently counted, it is comparable with that of Java and .NET. Another of Python's main features is the inclusion of a documentation system. The documentation was taken into account when designing the language. For example, all functions and classes have an implicit variable called * .doc commonly called docstring or docstring.

These strings describe the use of that function or classes and the parameters involved in detail. The syntax of these docstring is very similar to that of JavaDoc. These documentation strings can even be called at runtime, so they can be consulted in the interpreter itself using the help function, a model very similar to the one used in MATLAB with toolboxes. The Python standard library was documented using this method (Challenger-Pérez, 2014). Other programs to generate reports and achieve a suitable solution to your design with the least possible effort from your computer, Es Mathcad has greatly expanded its interoperability and connectivity with other very popular packages in complementary applications such as: Microsoft Office, Visio 2000, Auto CAD, MATLAB, SmartSketch. This easy-to-use package combines an intuitive cut-paste diagram block interface with a powerful simulation system that enables fast and efficient feedback. You can select from more than 180 diagram blocks and connect them together using point-and-click commands (Bayarsaikhan, 2009). Mathcad is the standard software for solving, documenting, sharing, and reusing vital engineering calculations. Its easy-to-use instant update and mathematical notation, powerful communication capabilities, and open architecture enable engineers and organizations to optimize critical engineering and design processes. Mathcad Prime, the latest version of Mathcad software, is the most advanced and efficient version yet, and includes the ability to allow users to reuse old worksheets. Mathcad Prime combines ease of use with superior performance and powerful features (Bayarsaikhan, 2009).

The MATLAB Report Builder provides functions and APIs that integrate reporting capabilities into MATLAB applications. The MATLAB Data API enables and provides a way for applications running outside of MATLAB to work with data through a neutral program interface. The API uses C ++ design patterns and semantics, but is not compatible with the API for manipulative matrices in C. You can develop programs that generate reports in PDF, Microsoft® Word, Microsoft PowerPoint®, and HTML. MATLAB Report Generator enables you to dynamically capture the results and figures from your MATLAB code and document those results in a single report that can be shared with others in your organization. You can use the predefined and customizable Word and HTML templates or design reports based on the templates and standards.

MATLAB Report Generator (MathWorks, 2021) provides another set of objects for generating report content. The Document Object Model (DOM). They implement a model of a document used by html, word, and other document creation software. The model defines a document as a hierarchy of objects commonly found in documents, such as text strings, paragraphs, images, and tables.

In this work, a software available on the portal of the University page was used (DGTIC, 2021). For this particular case in the programming we only generate files with docx or pdf station, if it is modified it can generate the html and ppt extensions, generating the results of the mathematical and graphical calculations during the online class modality of the Electronic Electrical Engineering Career, for him to send documents and carry out the evaluation at the end of the activity.

Objectives

A code will be programmed to develop reports in * .docx or * .pdf files that can help reinforce learning in a practical way with applications in the area of Physical Mathematical Sciences and Engineering to generate mathematical calculations and graphs during the modality of online classes

Hypothesis

Online classes during this SARS CoV2 severe acute respiratory syndrome health contingency. It has become a challenge for academics and students of the Electronic Electrical Engineering Career of the Faculty of Higher Studies Aragón at the National Autonomous University of Mexico. If a code is programmed to develop reports in files with the extension * .docx or * .pdf, where operations can be calculated with mathematical analysis, then the results and graphs corresponding to the activities assigned during the online class mode can be obtained, students will be able to submit their work for evaluation instantly.

Development

It is very important to redirect the route since this can generate an error when generating the report, we must know exactly where the folder is, since there it will generate the file in extension *. pdf, *. docx, *. ppt.

```
C:\Users\My_File\Documents\MATLAB\report_pdf
C:\Users\My_File\Documents\MATLAB\report_docx
C:\Users\My_File\Documents\MATLAB\report_ppt
C:\Users\My_File\Documents\MATLAB\report_html
```

The following commands are important to be able to eliminate any function or class that has been created in ItemType eliminates all variables and frees them from memory all allows you to delete everything, you can use the following depending on the need clear classes, clear all, clear functions , clear import, clear java, clear mex, clear variables the latter can delete specific variables and the code used particularly in this work was the following:

```
clear ItemType; clear all;
```

To create a document that defines the output in html, pdf, Word or ppt, we add the content in the body and we can visualize the information in the file generated for this case we use the following package mlreportgen.dom.

```
import mlreportgen.dom.*
import mlreportgen.report.*
R=Report('Nombre del archivo ','extensión');
open(R);
```

DocObj = Document () creates an HTML document named name.html in the current directory, using the default html template. Add content and use a corresponding close command to generate the document. DocObj = Document (outputPath, type), outputPath specifies the full path of the output file or folder of this document. type creates a document with the specified extension with its example location (for example, 'NameFile.html', 'NameFile.docx', 'NameFile.pdf', or 'NameFile.ppt'.), in this case the file is generated in the same folder with the specified extension.

A summary can be placed in a report using as an optional form for the report.

One of the components of the page is the title, this must be a secondary element of the format, for reports in *.docx, *.pdf, *.html, or *.Ppt you can use the style sheet editor to place the elements of the page such as: title, copyright and images) anywhere on the front or back of the page. And you can specify Style You can specify the style such as bold, italic, size, underline, strikethrough and color, in the text. Within the style that we should not ignore is the alignment of the text since it can be centered, left, right and self-aligning.

For this format carried out for delivery of activities, the title can be used at the beginning of the document, but it is omitted so that an image with the logos of the educational institution can be placed. We use Telepate; Text ('The title is written'); To add the header of the report, use Text ('No text is placed') but in this report we do not omit the title, only that in the middle of the parentheses we do not place any text and Style that allows changing the style of the text in this case it can be changed the font, the color and the size, as well as if it is required to be the letter Bold: Italic: Underlined: Strikethrough. It also supports the alignment of reports in *.pdf or *.trf format support this property, the following structure is included.

```
titlepg = TitlePage;

titulo = Text(' ');

titulo.Style = {FontFamily('LMRomanM'),...

Color('red'),FontSize('13pt'),...

HAlign('justify')}; %center
```

The supported image formats are: *.bmp (Bitmap image), *.gif (Graphics Interchange Format), *.jpg (JPEG image), *.png (PNG image), *.emf (Enhanced metafile), these support and are supported only in *.docx output on Windows operating system platforms, *.svg (Scalable Vector Graphics), *.tif (not supported in *.html output), *.pdf (PDF image) (supported only in PDF output). You can create a custom formal image reporter and its associated default templates. The derived class file can create a specified path in relation to the current working folder, in case the image is in the current folder only the name and extension are placed, in case the image is in another folder the full address of the image is placed as shown below: C: \ Users \ MyFile \ Documents \ image.

At the same time you can create a style for the image in the template. It is the equivalent of changing the style of the typeface only that using Style allows you to change the style of the image, for example, change the width or height of the image, specified as a character vector or a string scalar consisting of a number followed by an abbreviation for a unit of measure. For example, "2 in" specifies two inches. Valid abbreviations are: px (default pixels), cm (centimeters), in (inches), mm (millimeters), pc (spades), pt (points), % (percentage). To create an image in a report, create a mlreportgen.dom.Image object, you can add it to one of these document, group, paragraph, list, table item objects.

```
titlepg.Image = 'cabeza.png'

Image.Style = {Width('2in'),...

Height('2in'),HAlign('center')};
```

To add the title or header of the report for this particular case, the following command is used since the title is left blank to be able to insert an image and later the title or header is placed using Text ('Header') and consecutively used Style that allows changing the style of the text in this case you can change the font, color and size, as well as if the font is required to be bold or italic, the following declaration is used in the program.

```
textocabeza = Text('Encabezado')

textocabeza.Style = {FontFamily('LMRomanM'),...

Color('red'),FontSize('13pt'),...

HAlign('center')}; %center
```

To continue the format of the dynamic report and place the author's name, we again use the Text command (['Author's Name']), in addition to using again the ".Style" style command of the Author object, as can be seen in the following box.

```
Autor = Text([' Nombre del Autor ']);

Autor.Style = {FontFamily('LMRomanM'),...

Color('blue'),FontSize('10pt'),...

HAlign('justify')}; %center

titlepg.Author = Autor;
```


Next, the personal information of the author (user) must be entered, in this section the student enters their identification data or institutional account number, the subject in progress, the group, as well as their address, telephone number and email to facilitate instant evaluation

```
Publicacion = Text(['Información sobre la
publicación ']);

Publicacion.Style = {FontFamily('LMRomanM'),...

Color('#2C805F'),FontSize('8pt'),...

HAlign('justify')}; %center

titlepg.Publisher = Publicacion
```

With the add function, you are able to handle multiple arguments. In this case the first argument will be the definition of the object, 'R', to which the content is added, which was defined previously; the second argument will be a set of two parameters, one to add the header to the report with the command "Text ('Header')" in the variable texthead, and titlepg adds the author's name with the instruction Author = Text (['Name Author ']);

```
add(R,{titlepg,textocabeza});
```

The flexibility of the dynamic report allows to append the statement of the problem to be solved, using the TEXT instruction (['Write the statement of the problem']); so that the students of the electronic electrical engineering career can read the statement of the exercise, analyze it and obtain the solution within the software in order to append and print only the mathematical analysis and the results for evaluation

```
Enunciado = Text(['Escribir Párrafo ']);

Enunciado.Style = {FontFamily('LMRomanM'),...

Color('#5B2C6F'),FontSize('12pt'),...

HAlign('justify')}; %center

add(R,Enunciado)
```

Within the argument of the statement that must be solved, it is necessary to attach the image of the schematic circuit to be analyzed, in this particular case the electronic circuit is essential to give an idea of the procedure and the mathematical analysis to generate the graphic interpretation of its results that is requested in the statement

```
image = FormallImage()

image.Image = which('Imagen.jpg');

text = Text(['Pie de Imagen ']);

text.Style = {FontFamily('LMRomanM'),...

Color('red'),FontSize('10pt'),...

HAlign('center')}; %center

image.Caption = text;

add(R,image)
```

Through programming we can describe each of the examples, how to design an active low-pass filter of the second order Butterworth type, using an operational amplifier with passive elements such as capacitors and resistors, for this particular case it is intended to work at a frequency of 450 Hz, so you must calculate the missing passive elements and calculate the angular frequency to know exactly where it intersects with the axis of the Magnitude in dB and with the phase if it presents the value of capacitor one of 47nF and capacitor two of 33 nF, its Bode plot must be reconstructed in magnitude and Phase for its graphical interpretation. The statement allows us to understand that the students of the electronic electrical engineering career are being asked where only the data will be modified such as the frequency f in units of [Hz] and the values of the passive elements of capacitor C1 and capacitor C2 to be able to obtain the results and to be able to immediately evaluate the students when a distance communication is being developed

```

C1=47E-09;
C2=33E-09;
F=450;
Wc=2*pi*F;
RR=sqrt(1/((Wc^2)*(C1*C2)));
R1=RR;
R2=RR;
Num=[0 1];
Den=[(C1*C2*R1*R2) (C1*R1+C1*R2) 1];
Hs=tf(Num,Den);
bode(Hs);
grid;
[mag,ph]=bode(Hs,Wc);
magdb=20*log10(mag);

```

A table is developed using the following commands to locate the data that is provided, in order to develop the mathematical analysis in the programming, only the values are shown and their representation, the value and the unit of the passive elements are placed in each cell, in the table the command "title" is used to place the title in the table header to indicate what it represents.

```

text = Text(['Datos de los componentes...' ...
'electrónico pasivos dados en el ...' ...
'ejercicio']);
text.Style = {FontFamily('LMRomanM'),...
Color('green'),FontSize('10pt'),...
HAlign('center')}; %center
Componentes = {'C1';'C2';'F'};
Datos = [C1;C2;F];
Unidades = {'nF';'nF';'Hz'};
table = BaseTable({Componentes, Datos, Unidades});
table.Title = text;
add(R,table);

```

In the following table, the variable Statement1 is generated, and it assigns the desired value through the Text command, and with the Style modifier it is possible to modify the font, color, size, as well as justify the text, to finish using the add function add and through the parameters of the function, specify the "Report" and the newly created variable Statement1 to be able to display the expression.

```

Enunciado1 = Text(['La ecuación obtenida...' ...
'de la función de transferencia usando...' ...
'los elementos pasivos se sustituyen ...' ...
'en la ecuación siguiente para obtener...' ...
'el diagrama de Bode']);
Enunciado1.Style = {FontFamily('LMRomanM'),...
Color('#0000ff'),FontSize('12pt'),...
HAlign('justify')}; %center
add(R,Enunciado1)

```

When using the command Equ = Equation ("Syntax used by Latex to place the equations"); To indicate the mathematical model and its characteristic equation of the equation that is obtained starting from the mathematical analysis of the electrical circuit represented through a schematic circuit, in order to express an equation in the dynamic report, it is necessary to have a basic knowledge of some LaTeX command this allows us to express the proper syntax for this particular case in the electronic electrical area at the end it is indicated to load the equation to the dynamic report to view it

```

Equ=Equation("Hs = \frac{1}{R1 R2 C1 C2 s^2 + (C1
R1+C1 R2)s + 1}");
add(R,Equ);

```


With the variable `text1 = Text ('Table Title');` and the modifier `.Style` we can edit the text, in the variable `Data1` we specify the first column of data from the previous table, the second column with the variable `Calculations`, taking into account that the calculations are made up of numbers, and finally the third `Units` column 1, then with the variable "table" we can enter all the data through the function `table = BaseTable ({Data1, Calculations, Units1})`, having as arguments the three previously specified variables, to finish with the edition of the data table we use the modifier `table.Title = text1` to add a title to the table and we use the function `add (Report, table);` to execute the previous modifications

```
text1 = Text('Cálculo de los elementos faltantes');
text1.Style =
{FontFamily('LMRomanM'),Color('green'),...
  FontSize('10pt'),HAlign('center')}; %center
Datos1 = {'Wc';'R1xR2';'R1'; 'R2';'magdb'; 'ph'};
Calculos = [Wc ;RR;R1;R2;magdb;ph];
Unidades1 = {'rad/seg';'Ohms';'Ohms'; 'Ohms';'dB';
'°'}
table = BaseTable({Datos1, Calculos, Unidades1});
table.Title = text1;
add(R,table);
```

To obtain the graphic representation in the dynamic report, it is required to generate it and export the image file with any of the following extensions `*.jpg`; `*.Png`; `*.Tif`; `*.Pdf`; `*.eps` in this case the extension `*` is used. "Jpg" using the following command `exportgraphics (gcf, 'Graphic name.jpg');` In order to use it and create a report for an image with a caption, the report properties are used to set the image font, title, height, width, etc. The report can be formatted as enumerating the title and placing it in the image caption, using the `image.Caption = text` object; In case it is required to use the value of a data or calculation that is required to be placed in the image footer, the analysis is first developed and later the number is changed to a string of characters, in this particular case two data is used, one that comes from the value of the magnitude and the other from the value of the phase between these two data is handled characters.

```
exportgraphics(gcf, 'BodeMagnitudFase.jpg');
image = FormallImage();
image.Image = which('BodeMagnitudFase.jpg');
text1 = Text(['Diagrama de Bode en Magnitud y fase '
...
  'donde la frecuencia angular Wc = '])
text1.Style = {FontFamily('LMRomanM'),...
Color('red'),FontSize('10pt'),HAlign('left')};
text2 = Text(char(num2str(Wc)))
text2.Style = {FontFamily('LMRomanM'),...
Color('blue'),FontSize('10pt'),HAlign('left')};
text3 = [text1;text2]
text4 = Text(' rad/seg y la fase ph = ')
text4.Style = {FontFamily('LMRomanM'),...
Color('red'),FontSize('10pt'),HAlign('left')};
text5 = [text3;text4;]
text6 = Text(char(num2str(ph)))
text6.Style = {FontFamily('LMRomanM'),...
Color('blue'),FontSize('10pt'),HAlign('left')};
text7 = [text5;text6;]
text8 = Text('°')
text8.Style = {FontFamily('LMRomanM'),...
Color('red'),FontSize('10pt'),HAlign('left')};
text9 = [text7;text8;]
image.Caption = text9;
add(R,image)
```

With the command "close (R)" we end the editing process of the file, now the dynamic report is already with the calculations, the mathematical analysis, and the graphic expression so that the student of the electronic electrical engineering career can send the report immediately and be evaluated.

```
close(R);
```

The command “rptview ('Amplifier', 'pdf)’ is capable of interacting with programs that allow the preview of the dynamic report such as: * .html, * .pdf, * .docx or * .ppt, this instruction uses two arguments, which will be used to specify the name of the file and the extension with which the report was generated.

```
rptview('Amplificador','pdf');
```

Results

Implementing templates for the generation of dynamic reports allows a simpler result in the development of remote activities, and that there is good oral, written and visual communication of the academic with the students of the Electronic Electrical Engineering Career. The MATLAB program provides a tool to perform the mathematical analysis of a Butterworth type second-order low-pass filter, avoiding recurrent arithmetic or algebraic errors of students, with this, a better way of teaching-learning is transmitted and facilitates the academic establish a better communication, during this contingency the students shared the assigned activities, the dynamic reports were activities in class, homework, expositions and the delivery of projects establishing the norm and using the syntax of the area of physical, mathematical sciences and engineering, this allowed the student had the best results in his evaluation.

Conclusions

The necessary code was developed to use the MATLAB program available free of charge for students of the Electrical and Electronic Engineering Career, provided through agreements with The MathWorks company. In this particular case, students were asked to generate dynamic reports to solve the analysis of a Butterworth-type second-order low-pass filter, obtaining the mathematical calculations, its transfer function and the graphic expression, generating the Bode diagram in magnitude and phase. The method of generating dynamic reports allowed the students of the Electronic Electrical Engineering career to maintain a distance communication with the academic, due to confinement due to severe acute respiratory syndrome (SARS CoV2), due to the above they were used templates for generating reports with extension * .pdf, * .docx for distance classes.

Making it possible for the student to be evaluated immediately, this allows teaching-learning to be simpler.

Annexed

Below is a dynamic report developed by the students of the electronic electrical engineering career implementing an activity to solve a Butterworth type second-order low-pass filter, showing the exercise established in a remote session for the students to use the template that generates a dynamic report in * .docx format where the transfer function, the calculated variables and the graphic expression are shown to be able to visualize the angular frequency and locate the points of intersection with the dB axes and the phase.



Activity 1: Butterworth-type active low-pass filter and its Bode diagram

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It is required to design an active low-pass filter of the second order Butterworth type, using an operational amplifier with passive elements such as capacitors and resistors, for this particular case it is intended to work at a frequency of 450Hz, so the missing passive elements must be calculated. and calculate the angular frequency to know exactly where it intersects with the axis of the Magnitude in dB and with the phase if it presents the value of capacitor one of 47 nF and capacitor two of 33 nF, its Bode diagram must be reconstructed in magnitude and Phase for its graphic interpretation.

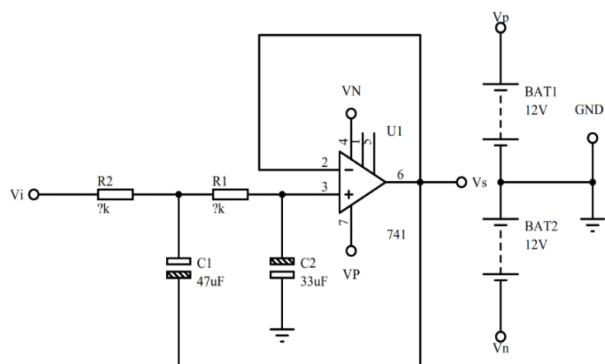


Figure 1 Schematic circuit of a Butterworth-type active low-pass filter

C1	4.699999999999997e-08	nF
C2	3.299999999999998e-08	nF
F	450	Hz

Table 1 Data of the passive electronic components given in the exercise

$$Hs = \frac{1}{C_1 C_2 R^2 s^2 + (C_1 + C_2) R s + 1}$$

Wc	2827.4333882308138	rad/seg
R1xR2	8980.5248504331703	Ohms
R1	8980.5248504331703	Ohms
R2	8980.5248504331703	Ohms
magdb	-	dB
ph	7.5564390938579251 -90	°

Table 2 Results of calculations and obtaining the missing passive components

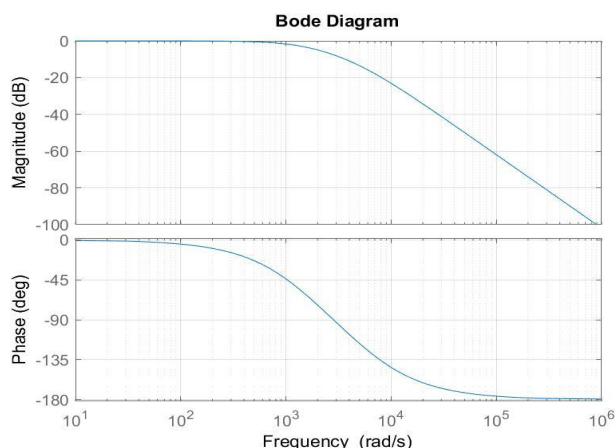


Figure 2 Bode diagram in Magnitude and phase where it is observed that the circuit is a low pass filter and its angular frequency is $Wc = 2827.4334$ rad / sec and the phase is $ph = -90^\circ$ and all higher frequencies are rejected since this is a main feature of this configuration.

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